A Summary of Gulf of Mexico Red Grouper Discard Length Data Collected from At-Sea Observers in Recreational Fishery Surveys in Florida

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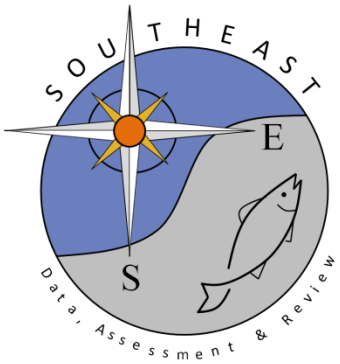

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A Summary of Gulf of Mexico Red Grouper Discard Length Data Collected from At-Sea Observers in Recreational Fishery Surveys in Florida

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For: SEDAR 88, Gulf of Mexico Red Grouper.

Detailed information on the size and release condition of discarded fish is not collected in traditional dockside surveys of recreational fisheries. At-sea observer surveys provide valuable information on the size and condition of discarded fish, and such surveys have been conducted on for-hire vessels in Florida since 2005. The majority of these observer trips were conducted on headboat vessels, with charter vessels being surveyed intermittently starting in 2009 (Table 1). This report provides a summary of available information on the size and disposition of Red Grouper collected by trained observers since 2005 during at-sea surveys on for-hire vessels in the eastern Gulf of Mexico.

At-Sea Observer Survey Coverage

Age and length information included here were collected from at-sea observer surveys between 2005 and 2022. No sampling occurred between April 2020 and May 2021 due to the COVID-19 pandemic.

Gulf Coast of Florida (NWFL, SWFL)

Headboat observer surveys were conducted on the Gulf coast of Florida from 2005 to 2007, funded by the Gulf Fisheries Information Network (GulfFIN). In June 2009, the state of Florida secured alternative funds to continue at-sea observer coverage in the northwest panhandle and central peninsula, including both the charter and headboat fleet. Data collected in these regions in 2014 was omitted from these analyses, as the observers only sampled a subset of the for-hire fleet that may not be representative of the fleet as a whole in that year.

Florida Keys (KEYS)

Headboat observer surveys were conducted in the Florida Keys from 2005 to 2007, funded by the Gulf Fisheries Information Network (GulfFIN) along with the Gulf coast. In 2010, headboat sampling coverage in the Florida Keys was re-initiated, along with the initiation of charter boat sampling. In 2014, representative at-sea observer data was only collected from charter vessels in the Florida Keys.

At-Sea Observer Survey Methods

Florida – 2005 to 2007

Headboat vessels from Florida were randomly selected each week. Florida's western central region also had a separate sample quota for multi-day trips that fish in areas farther offshore. Operators from selected vessels were contacted by state biologists and a single trip was arranged in a selected week. Dependent upon the number of customers on board, one or two biologists

accompanied passengers during the scheduled trip. The captain and mates cooperated by making sure fish caught by their anglers were observed by one of the biologists before they were stored in the fish hold or released overboard. Biologists would assist with dehooking fish for data collection but were not permitted to influence the decision to keep or release a fish.

Trip level information collected included the area fished, duration of fishing (to the nearest half hour), number of anglers, and minimum and maximum depths (feet) of the fishing sites. For each fish, biologists recorded the species, disposition, size (fork length in mm), and the condition of fish that were released. A brief interview with each angler observed during a trip was also conducted to collect information on primary and secondary target species, angler avidity, and state and county of residence.

Florida – 2009-2022
Similar to methods described above, charter and headboat vessels were randomly selected each week from a list of participating vessels in the northwestern region and central western regions of Florida. Selected vessels are contacted in advance to schedule a single trip during the selected week. Trips are scheduled based on vessel capacity. For example, when 6-pack vessels are selected, a trip is scheduled on a day where the reservation is for a party of 5 or less anglers. If there is no room available on a selected vessel for any reserved trips during the selected week, another vessel is randomly selected.

Participating vessel operators permit up to two FWC biologists to board during a scheduled trip, and captains and mates actively assist biologists by permitting them to observe and collect data from fish as they are removed from anglers' gear and before fish are released or placed in the fish box. Vessel operators also provide biologists with information on depth and area fished (commercial statistical area and/or degrees and minutes latitude and longitude) for each fishing station during each observed trip.

For each fish, biologists recorded the species, disposition, size (fork length in mm), and the condition of fish that were released in the same manner as 2005-2007. Additionally, a subset of anglers was tracked by the biologist(s) for the entirety of the trip. For these anglers, hook type, hook size and hook location were recorded of the fish that they captured.

A project coordinator conducted quality assurance and quality control checks on all field data as it was collected and submitted. Following data entry, electronic data were proofed against field data sheets.

Data Elements

Disposition was coded as:
<u>Discards</u>
1: thrown back alive, legal;
2: thrown back alive, not legal;
<u>Harvest</u>

3: plan to eat;
4: used for bait or plan to use for bait;
5: sold or plan to sell;
6: thrown back dead or plan to throw away.

Release Condition was coded as:
Good – Fish that were able to submerge and swim away immediately after release
Fair – Fish that re-submerged and swam away with minor difficulty
Bad – Fish released that demonstrated extreme difficulty re-submerging or swimming
Dead – Fish that were released dead, preyed upon by mammals or preyed upon by birds

Area fishes was coded as:
For southeast and northeast Florida:
1: 3 miles or less from shore; or
2: more than 3 miles from shore
For Keys, western peninsula, and northwest Florida:
3: 10 miles or less from shore; or
4: more than 10 miles from shore.

Regions were grouped as:
NWFL: headboat area 23
SWFL: headboat area 18, 21
KEYS: headboat area 12, 17

Characterization of Trip Duration:
Sampled trips were categorized into the following trip-types based on the duration of the sampled trip:

- Single-Day Trips (<24 hours)
    - Half-Day: < 6 hours
    - Three-Quarter-Day: 6 – 8 hours
    - Full-day: 9 – 24 hours
- Multi-Day Trips (>24 hours)

At-Sea Observer Survey Data Analysis
Proportional Fishing Effort for Headboats
Headboat trips were not sampled proportional to fishing effort. For example, multi-day trips represent less than 3% of headboat fishing effort in Florida but were sampled at a much higher rate in at-sea observer surveys. In the northwestern region of Florida, half-day trips were under-sampled with respect to headboat effort. We generated weighting factors for different trip-types using fishing effort data reported on headboat logbook trip reports for the years 2005 through 2022 (Table 4). Headboat effort data were provided by R. Cheshire from NMFS Southeast Fisheries Science Center in Beaufort, NC.

Proportional fishing effort was calculated as the total numbers of trips reported on logbook trip reports for a given trip-type in each region, divided by the total number of headboat trips reported in the same region (Table 2). To obtain the sample weight (W_t):

$$W_t = \frac{N_t/N}{n_t/n}$$

Where N_t/N is the number of trips of type t divided by total trips reported on logbook trip reports, and n_t/n is the number of trips of type t sampled during fishery observer surveys divided by the total number of sampled trips in each year. Trip-types with $W_t < 1$ are down weighted to account for oversampling and trip-types with $W_t > 1$ are inflated to account for undersampling. No multi-day charter trips were sampled, and weights were not generated for charter samples (Table 3).

Characterization of Discards:
Fish mid-line lengths were assigned to one cm length bin categories (40 cm bin = fish 39.6 cm to 40.5 cm) and the number of lengths in each length bin category were summed by region, trip-type, and disposition (harvested and discarded).

For fish observed from headboats, counts of fish in each length bin were multiplied times the sample weight (W_t) for each trip-type and sample region. The weighted proportion of fish in a length bin (p_x) was calculated as follows:

$$p_x = \frac{\sum L_H * W_H + \sum L_F * W_F + W_Q * W_Q + W_M * W_M}{\sum(bin = i = 1 \ldots n[\sum L_H * W_H + \sum L_F * W_F + W_Q * W_Q + W_M * W_M]}$$

Where L_H equals the number of fishes in length bin x for a given disposition in each region observed during half-day trips (H); and W_H is the weighting factor for half-day trips in the same region. Q = ¾-day trips, F = full-day trips, and M = multi-day trips. The denominator is the sum of all numerators for length bin 1 to length bin n. The number of discarded fishes was summed by trip type and multiplied by the weighting factor for each trip-type, by year, to construct the weighted discard length frequency distribution. For charter vessels, the discard length frequency was calculated by summing the raw number of discarded Red Grouper in each length bin and dividing this number by the total number of discarded fishes, by year.

Results
At-Sea Observer Trips
From 2005 to 2022 in Florida, headboat observers sampled 1,829 trips positive for Red Grouper, and 1,761 trips for discarded Red Grouper. There were 1,041 charter trips positive for Red Grouper, and 968 trips for discarded Red Grouper. The number of sampled trips by year and region for at-sea observer trips were provided in Tables 2 & 3. Sampling weights were used to adjust the number of headboat discards, as a function of under-sampling or over-sampling of different trip durations in each region of Florida (Table 4). A total of 24,312 discarded fish and 1,245 harvested fish were measured during headboat at-sea observer trips between 2005 and 2022 on western Florida coasts. For Florida charter trips, observers sampled 16,990 discarded fish and 1,994 harvested fish. Summary statistics for the length distribution of discarded and harvested fish observed during headboat and charter trips are provided in Tables 5 and 6. Length frequency histograms for harvested and released (discarded) Red Grouper by year are presented for Gulf of Mexico Florida headboats (Figure 1) and Gulf of Mexico Florida charter boats (Figure 2).

Table 1. Sampling coverage for At-sea observer trips in Florida, by region and year. The * indicates partial years of coverage. Sampling occurred from July to December in 2009, from January to March in 2020, and from June to December in 2021. + Indicates sampling occurring only in Tampa Bay area, exclude southern counties of SW FL.

Headboat Areas	**2005**	**2006**	**2007**	**2008**	**2009***	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020***	**2021***	**2022**
Northwest Florida	H	H	H		H,C	H,C	H,C	H,C	H,C		H,C	H,C	H,C	H,C	H,C	H,C	H,C	H,C
Southwest Florida	H	H	H		H^+,C^+	H^+,C^+	H^+,C^+	H^+,C^+	H^+,C^+		H,C	H,C	H,C	H,C	H,C	H,C	H,C	H,C
Florida Keys	H	H	H			H,C	H,C	H,C	H,C	C	C	H,C	H,C	H,C	H,C	H,C	H,C	H,C

Table 2. Florida sampled HEADBOAT at-sea observer trips positive for Red Grouper and for Red Grouper discards by year and region. Sampling in 2009 represents June to December, sampling in 2020 represents January to March, and sampling in 2021 represents June to December.

YEAR	NORTHWEST FLORIDA		SOUTHWEST FLORIDA		FLORIDA KEYS	
	Positive	*Discard*	*Positive*	*Discard*	*Positive*	*Discard*
2005	41	36	72	72	25	22
2006	25	20	84	82	27	23
2007	20	13	77	76	25	24
2009	12	11	44	44	.	.
2010	18	17	60	60	13	13
2011	21	16	65	65	13	12
2012	16	10	55	55	15	15
2013	8	5	60	60	12	12
2015	17	11	57	56	3	2
2016	9	6	121	120	22	21
2017	11	8	125	125	28	27
2018	7	6	124	124	53	53
2019	11	10	102	102	42	41
2020	.	.	19	19	7	7
2021	.	.	100	100	6	4
2022	4	4	119	119	34	33

Table 3. Florida sampled CHARTER BOAT at-sea observer trips positive for Red Grouper and for Red Grouper discards by year and region. Sampling in 2009 represents June to December, sampling in 2020 represents January to March, and sampling in 2021 represents June to December.

YEAR	NORTHWEST FLORIDA		SOUTHWEST FLORIDA		FLORIDA KEYS	
	Positive	*Discard*	*Positive*	*Discard*	*Positive*	*Discard*
2009	12	12	19	19	.	.
2010	23	14	40	39	5	5
2011	28	22	49	49	.	.
2012	25	11	47	47	9	8
2013	12	4	46	46	13	10
2014	.	.	.	.	8	7
2015	16	11	68	67	9	8
2016	11	4	83	83	11	10
2017	6	5	102	102	12	10
2018	4	2	92	91	12	12
2019	15	12	91	91	10	10
2020	1	0	20	20	.	.
2021	5	4	59	58	4	4
2022	3	1	64	63	7	7

Table 4. Weights generated to correct length frequencies to account for uneven sampling of trips with varying duration, by region, for HEADBOATS only.

YEAR	NORTHWEST FLORIDA			SOUTHWEST FLORIDA				FLORIDA KEYS			
	Half Day	*Three-Quarter Day*	*Full Day*	*Half Day*	*Three-Quarter Day*	*Full Day*	*Multi Day*	*Half Day*	*Three-Quarter Day*	*Full Day*	*Multi Day*
2005	1.596	0.668	0.952	1.524	0.68	2.004	0.001	0.401	0.26	.	0.965
2006	1.318	0.496	1.058	1.265	1.046	0.559	0.008	0.395	0.683	3.379	.
2007	1.273	0.425	1.36	1.93	0.775	0.749	0.064	0.78	0.43	.	0.245
2009	2.372	0.64	.	4.933	1.192	0.174	0.037	.	.	.	.
2010	1.484	0.965	0.446	3.385	0.952	0.133	0.045	0.828	0.661	.	.
2011	1.358	0.843	1.987	1.761	1.145	0.197	0.037	0.933	0.602	2.545	.
2012	0.807	0.951	2.149	1.471	1.151	0.481	0.037	1.165	0.282	.	.
2013	0.82	0.842	1.812	1.074	12.183	0.867	0.112	1.034	0.459	.	.
2015	1.18	0.615	2.105	0.803	2.052	1.215	0.49	0.78	.	.	.
2016	1.227	0.638	1.941	0.971	1.368	1.006	0.387	1.027	0.715	2.421	.
2017	0.851	0.743	2.538	0.832	1.51	1.246	0.551	0.831	3.734	.	.
2018	1.207	0.597	5.226	1.159	1.775	0.682	0.53	0.798	.	.	0.621
2019	0.658	0.876	3.973	1.166	1.033	0.867	0.518	0.804	.	.	0.454
2020	0.54	0.845	.	1.04	0.981	0.837	.	0.758	.	.	.
2021	1.054	0.657	6.332	1.288	2.063	0.509	.	0.781	.	.	.
2022	0.837	0.86	2.065	1.438	1.558	0.564	1.056	0.861	11.009	0.38	0.201

Table 5. Length summaries for discarded and harvested Red Grouper observed on HEADBOAT trips in western Florida, by year and region. Sampling in 2009 represents June to December, sampling in 2020 represents January to March, and sampling in 2021 represents June to December.

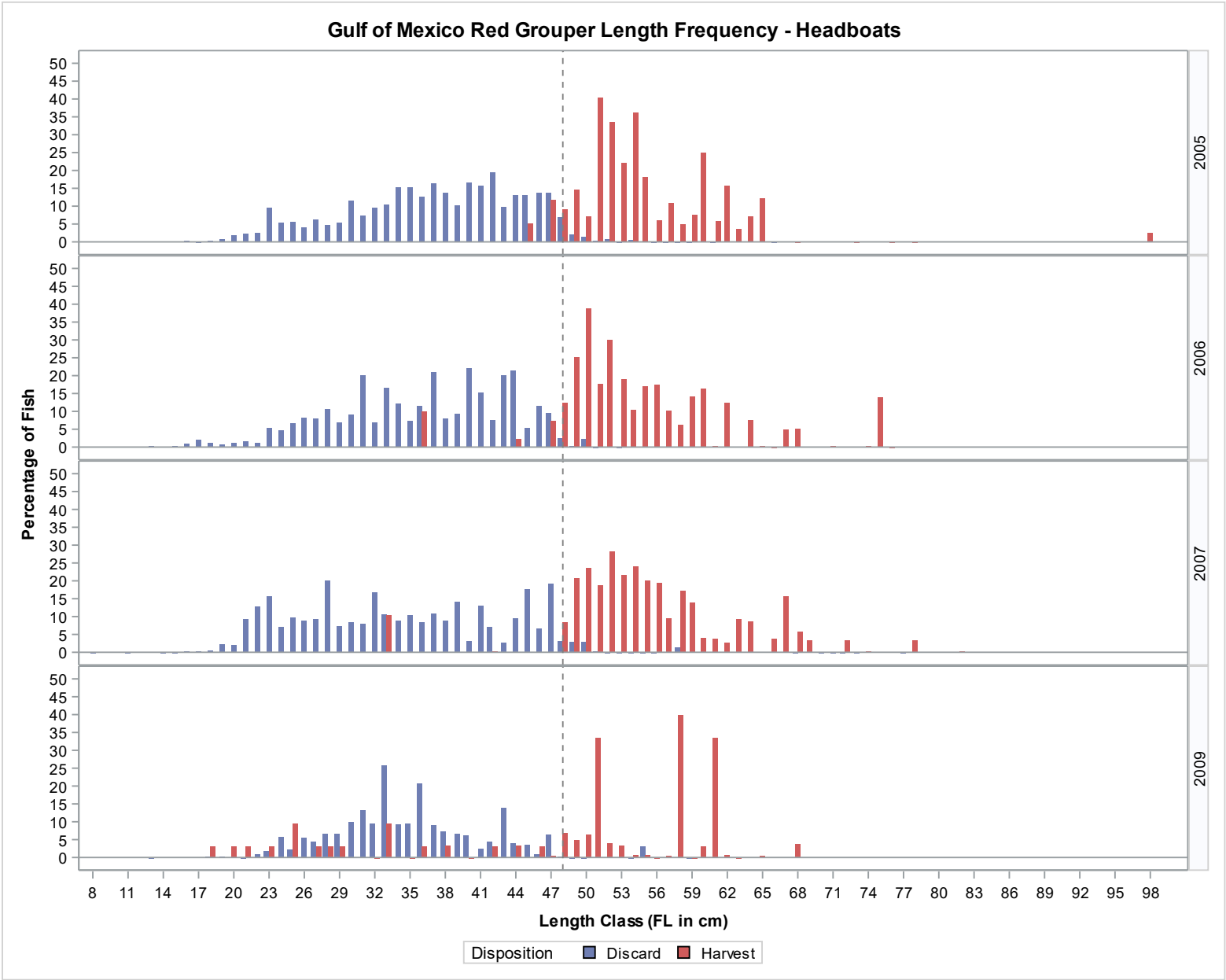
YEAR	DISCARDS				HARVEST			
	N	Min	Mean	Max	N	Min	Mean	Max
NORTHWEST FLORIDA								
2005	205	240	412.4	523	34	491	564.6	978
2006	56	246	420.7	497	24	438	539.9	681
2007	19	215	367.8	501	20	495	553.1	670
2009	27	240	375.3	549	3	509	568	614
2010	22	300	405.7	490	4	495	522.5	558
2011	34	330	429.5	609	12	508	569.1	740
2012	19	395	468.8	580	9	508	548.9	620
2013	8	415	486.4	585	4	578	633.3	740
2015	11	223	412.7	502	7	620	675.1	750
2016	6	318	420.3	486	4	487	642	746
2017	8	221	365.6	453	4	595	679.5	775
2018	7	351	412.9	460	2	510	513	516
2019	11	219	414	475	2	494	529.5	565
2022	27	235	318.2	610	.	.	.	.
SOUTHWEST FLORIDA								
2005	1114	159	341.4	656	41	475	567.1	781
2006	1047	135	348.5	530	79	475	564.6	756
2007	1617	85	331.5	774	146	422	544.2	825
2009	1944	129	343.5	586	67	179	468.1	680
2010	2125	160	358.8	658	47	104	542.4	728
2011	1637	161	386.3	744	56	368	553.1	760
2012	1035	183	401	748	116	340	535.4	740
2013	1069	165	395.5	801	54	320	523.6	650
2015	621	167	346.4	570	20	485	560.3	640
2016	1562	148	312.3	890	151	315	598.3	810
2017	1633	152	309.3	500	45	486	574.4	762
2018	1630	160	331.6	640	39	360	574.7	775
2019	1331	155	363.3	565	86	320	544	788
2020	170	190	320.8	490	5	550	583	640
2021	1708	162	312.5	800	28	480	544.9	660
2022	2463	150	307.2	675	45	270	565.8	785
KEYS								
2005	68	213	376.4	503	13	446	538.2	646

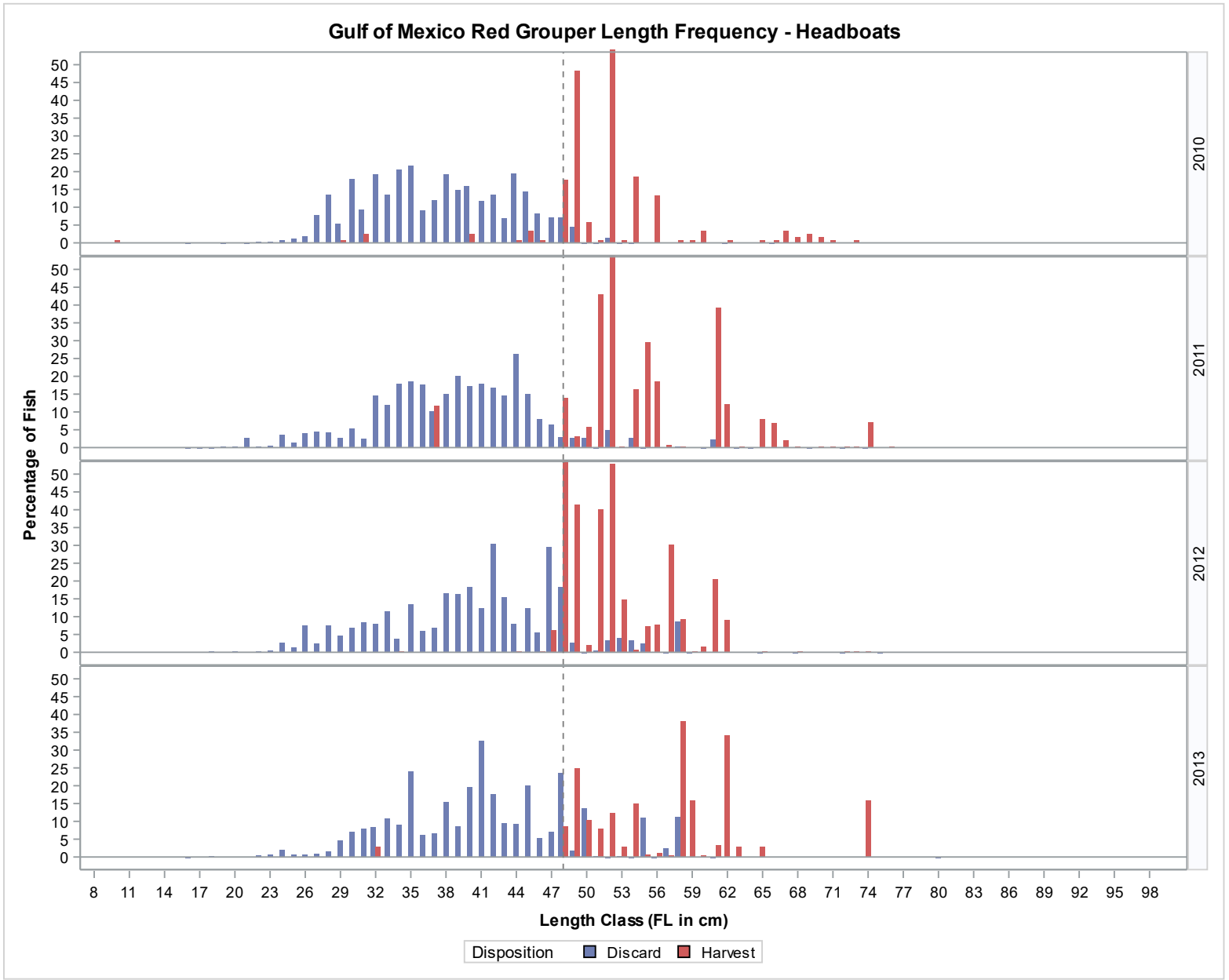
2006	53	274	369.6	478	10	360	514.9	605
2007	102	219	360.7	580	23	333	592.7	781
2010	57	268	367.2	522	.	.	.	.
2011	41	214	377.5	542	2	523	565	607
2012	49	241	371	550	5	480	522.8	610
2013	42	286	385.6	574	.	.	.	.
2015	6	340	389	444	1	618	618	618
2016	56	232	383.3	540	6	487	573.8	742
2017	44	196	387.4	519	1	483	483	483
2018	272	187	323.9	526	9	480	550.1	612
2019	168	227	364.9	567	4	500	537.8	630
2020	15	250	385.6	542	.	.	.	.
2021	8	226	340.4	430	2	474	537	600
2022	165	210	341.8	570	15	482	523.5	580

Table 6. Length summaries for discarded and harvested Red Grouper observed on CHARTER BOAT trips in western Florida, by year and region. Sampling in 2009 represents June to December, sampling in 2020 represents January to March, and sampling in 2021 represents June to December.

YEAR	DISCARDS				HARVEST			
	N	Min	Mean	Max	N	Min	Mean	Max
NORTHWEST FLORIDA								
2009	20	283	393.5	465	1	637	637	637
2010	26	349	424.7	475	26	479	560	775
2011	82	360	432.2	502	43	495	564.3	780
2012	16	410	485.7	587	37	490	567.6	780
2013	5	290	444.6	578	14	500	579.1	820
2015	18	295	410	690	9	522	665.7	819
2016	5	281	378.2	469	9	508	657.4	810
2017	5	208	354.8	471	2	533	674	815
2018	2	370	391	412	2	509	530	551
2019	14	345	429.1	503	4	495	504.5	525
2020	.	.	.	.	1	514	514	514
2021	7	310	415.4	480	10	481	592.7	830
2022	1	448	448	448	3	590	668.7	813
SOUTHWEST FLORIDA								
2009	1010	204	354	582	39	304	557.1	743
2010	2294	212	356.5	548	79	472	551.1	738
2011	1759	256	389.1	718	75	470	521.6	632
2012	1314	208	408	765	140	454	529.7	820
2013	1169	100	412.9	640	161	435	519.3	763
2015	1241	155	391.9	648	243	485	572.1	810
2016	1245	200	356.3	582	185	475	544.5	750
2017	1647	180	337.3	750	150	220	554.1	831
2018	1306	179	354	543	140	480	591.3	799
2019	1383	175	384.1	650	204	470	561.2	742
2020	311	115	376.9	496	60	480	550.9	720
2021	904	175	383.7	870	163	437	566.1	780
2022	977	110	342	643	163	480	577.6	775
FLORIDA KEYS								
2010	6	262	392.5	455	1	510	510	510
2012	8	324	388.9	564	1	653	653	653
2013	15	326	421.3	559	5	489	507	549
2014	26	239	392.1	543	3	465	505	550
2015	19	233	398.6	537	7	498	627.6	720
2016	26	230	366.2	468	8	480	544.5	680

2017	26	247	356	496	6	474	529.7	657
2018	22	235	351.9	590	.	.	.	.
2019	38	257	383.3	491	.	.	.	.
2021	19	245	358.2	475	.	.	.	.
2022	24	230	344.6	500	.	.	.	.


Gulf of Mexico Red Grouper Length Frequency - Headboats
Percentage of Fish
0 5 10 15 20 25 30 35 40 45 50
2005
2006
2007
2009
8 11 14 17 20 23 26 29 32 35 38 41 44 47 50 53 56 59 62 65 68 71 74 77 80 83 86 89 92 95 98
Length Class (FL in cm)
Disposition
Discard
Harvest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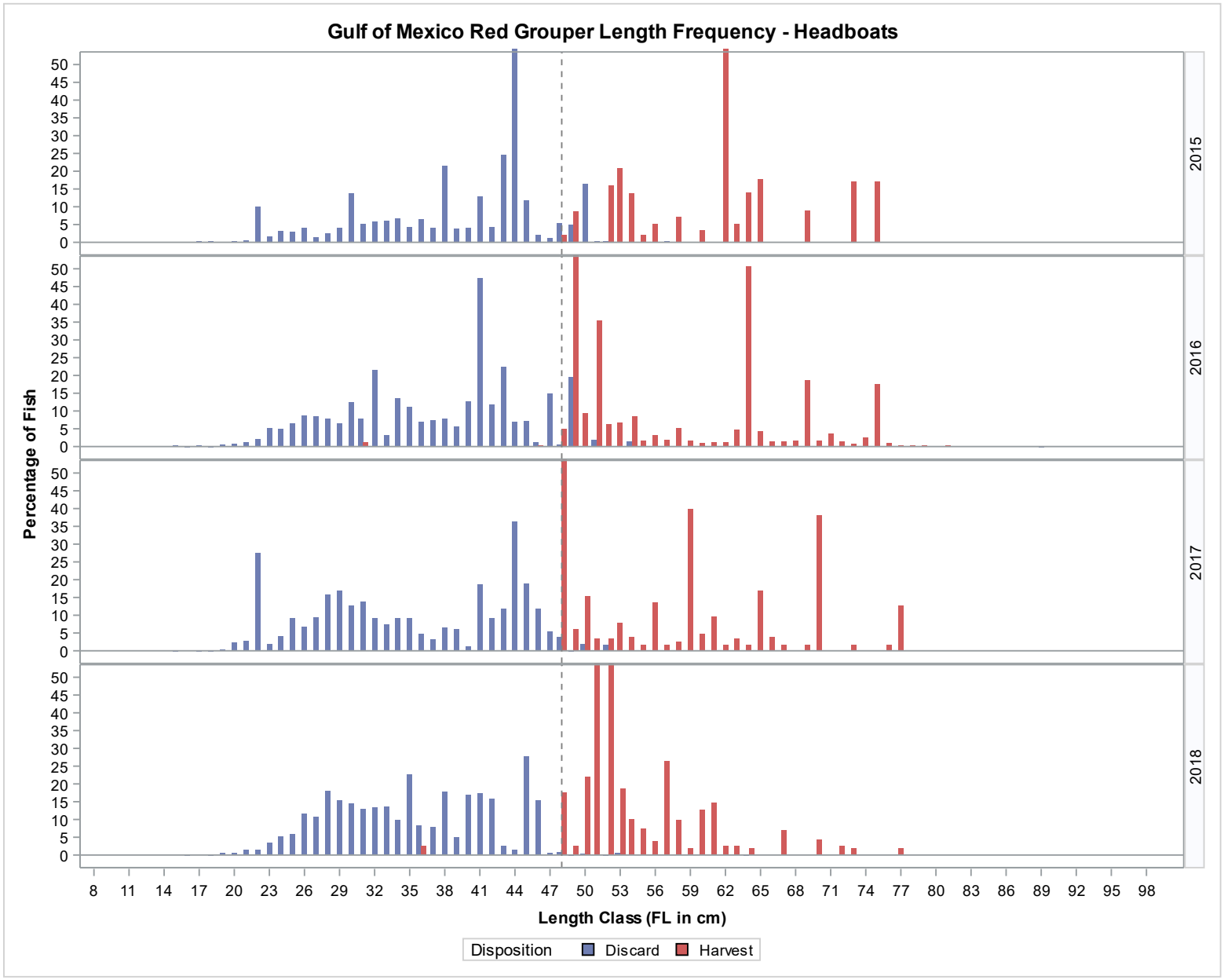
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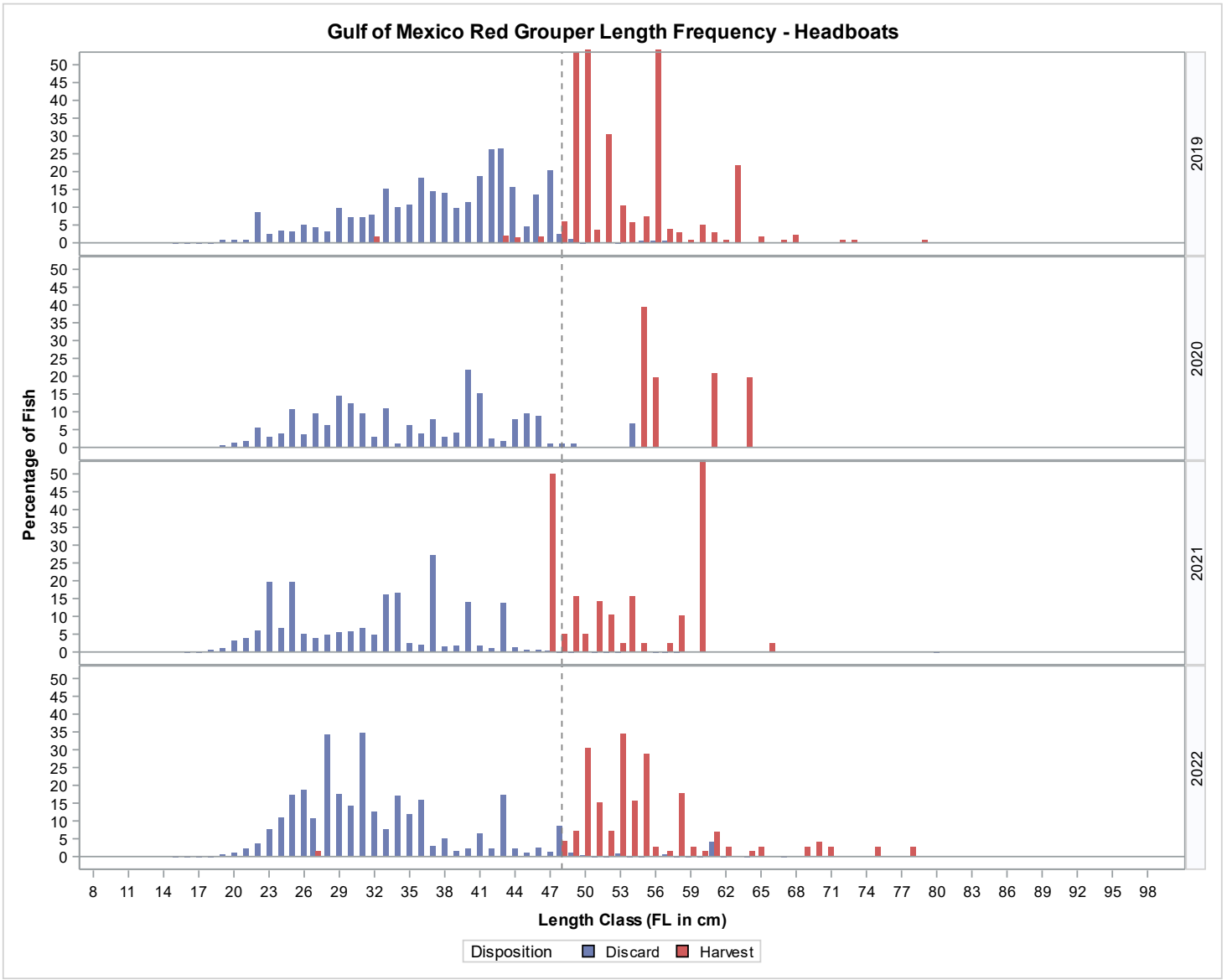
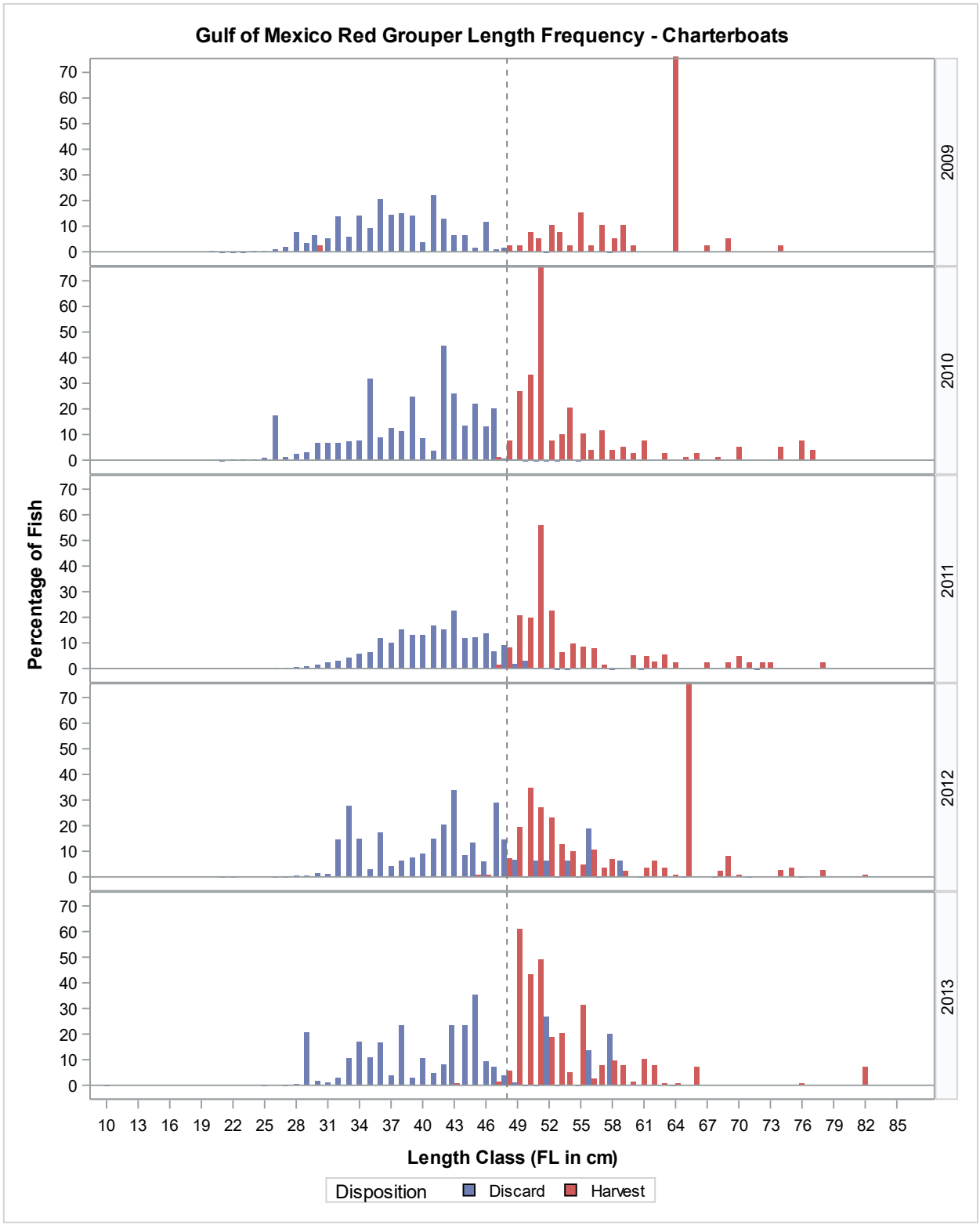


Figure 1. Weighted length frequencies of harvested and released Red Grouper measured by at-sea observers on HEADBOATS in Northwest Florida, Southwest Florida, and the Florida Keys from 2005-2022. Harvest includes fish that were released dead.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Percentage of Fish
0
10
20
30
40
50
60
70
2009
2010
2011
2012
2013
10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
Length Class (FL in cm)
Disposition
Discard
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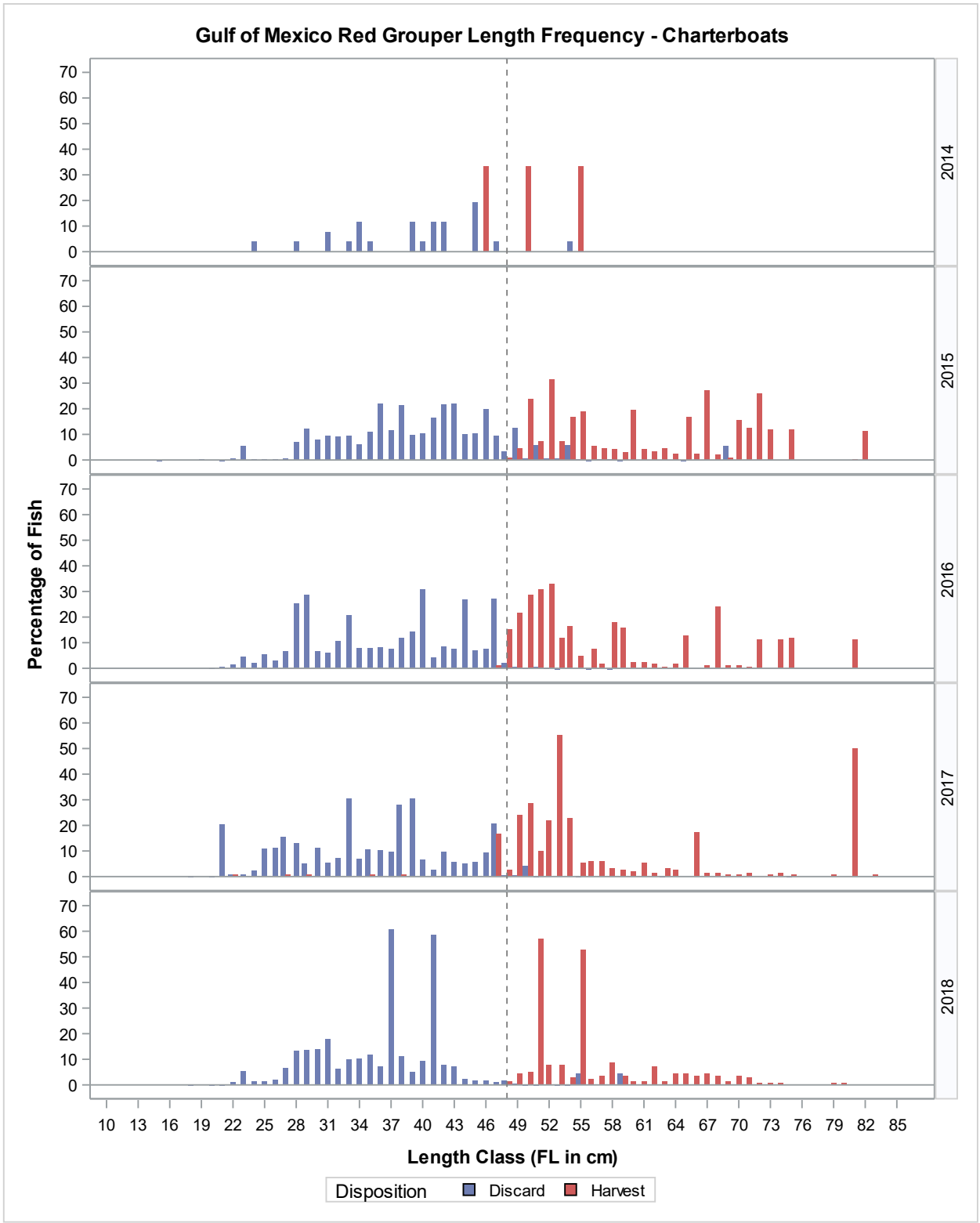
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Length Class (FL in cm)
Disposition
Discard
Harvest

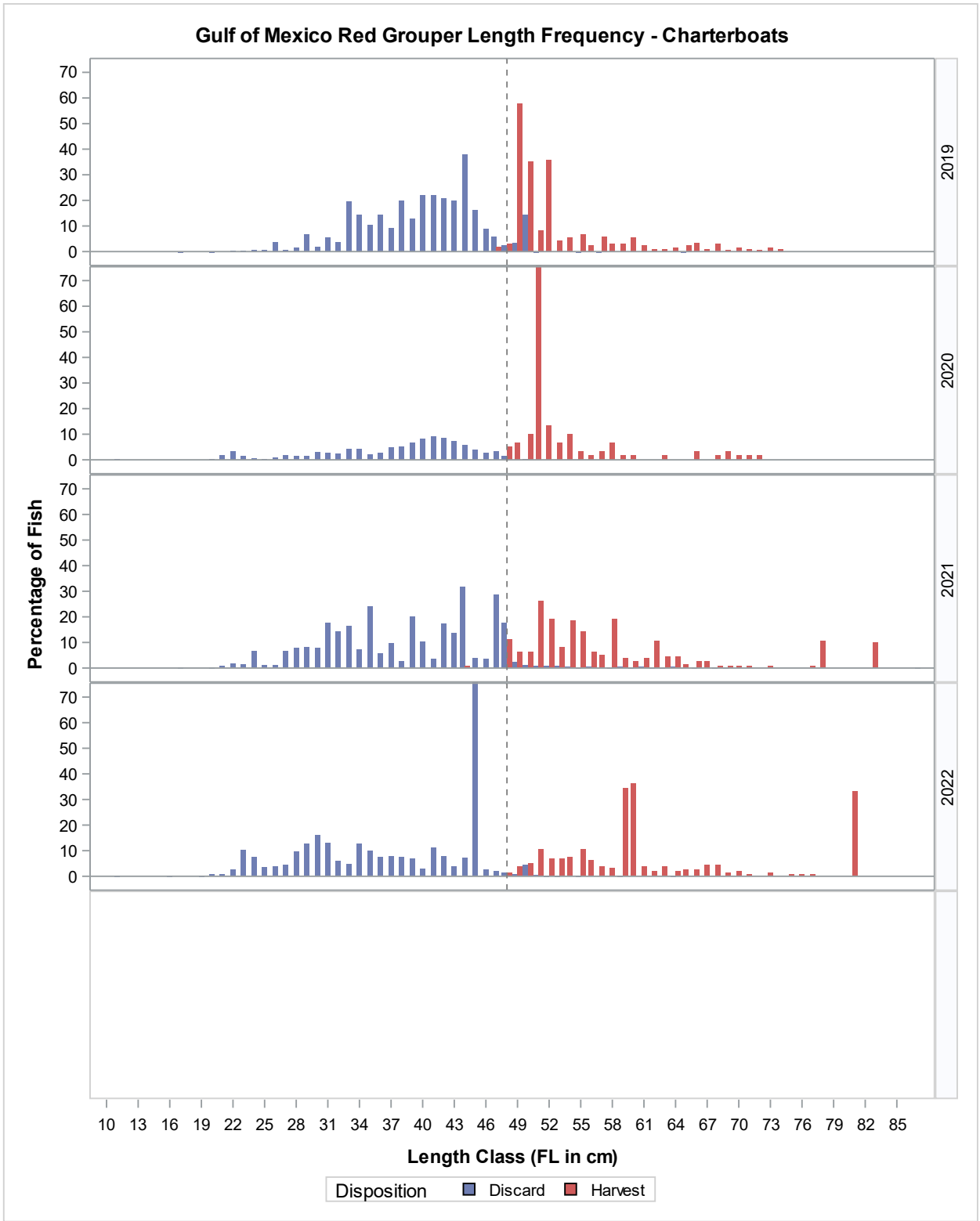

Figure 2. Length frequency of harvested and released Red Grouper measured by at-sea observers on charterboats in Northwest Florida, Southwest Florida, and the Florida Keys, from 2009-2022 (2014 represents Keys only). Harvest includes fish that were released dead.